Staff Report

USE INFORMATION AND AIR MONITORING RECOMMENDATION FOR THE PESTICIDE ACTIVE INGREDIENT FENAMIPHOS

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A. BACKGROUND

This recommendation contains general information regarding the physical-chemical properties and the historical uses of Ethyl 3-methyl-4-(methylthio)phenyl (1-methylethyl) phosphoramidate (fenamiphos). The Department of Pesticide Regulation (DPR) provides this information to assist the Air Resources Board (ARB) in their selection of appropriate locations for conducting pesticide air monitoring operations.

Fenamiphos (CAS: 22224-92-6) exists as a colorless solid. Fenamiphos has a molecular formula of $C_9H_{10}Cl_2N_2O_3$ and a molecular weight of 249.10 g/mole. It has a Henry's Constant of 9.5×10^{-10} atm·m³/mol at 30 °C, and a vapor pressure of 9.98×10^{-7} mmHg at 30 ºC. Fenamiphos is soluble in water at 306, 329, and 419 mg/L at 10, 20, and 30ºC, respectively. It is miscible with acetone, dimethylsulfoxide, ethanol, and many other common organic solvents.

In soil, fenamiphos oxidizes to the corresponding sulfone and sulfoxide. Its half-life in Arredondo soil is 38-67 days.

Fenamiphos's acute oral LD_{50} is 15.3 and 19.4 mg/kg, for male and female rats, respectively. Its LC_{50} (96 hour) is 72.1 µg/L for rainbow trout, 9.6 µg/L for bluegill sunfish, and 3,200 µg/L for goldfish. Fenamiphos entered the risk assessment process at DPR under the SB 950 (Birth Defect Prevention Act of 1984) based on mutagenic effects.

B. USE OF FENAMIPHOS

As of February 19, 1997, three fenamiphos-containing products were registered for use in California. Fenamifos is a systemic organophosphate nematicide–insecticide.

With DPR's implementation of full pesticide use reporting in 1990, all users report the agricultural use of any pesticide to their county agricultural commissioners, who subsequently forward this information to DPR. DPR compiles and publishes the use information in the annual Pesticide Use Report (PUR). Because of California's broad definition for agricultural use, DPR includes data from pesticide applications to parks, golf courses, cemeteries, rangeland, pastures, and rights-of-way, postharvest applications of pesticides to agricultural commodities, and all pesticides used in poultry and fish production, and some livestock applications in the PUR. DPR does not collect use information for home and garden use, or for most industrial and institutional uses. The information included in this monitoring recommendation reflects widespread cropland applications of fenamiphos. Use rates were calculated by dividing the total pounds of fenamiphos used (where fenamiphos was applied to acreage) by the total number of acres treated.

In California, the primary use of fenamiphos is to control nematodes in certain fruit, vegetable, and ornamental crops. Further benefits of fenamiphos use is the secondary control of some soil weevils. Fenamiphos is formulated as either an emulsifiable concentrate or as granules. Labeled use rates range from less than one pound per acre for the treatment of early season cotton to nine pounds per acre for the control of nematodes in grapes. Fenamiphos-containing products include the Signal Word "Poison/Danger" on their labels.

According to the PUR, over 95 percent of California's total fenamiphos use occurs in twelve counties (Table 1). The information included in this monitoring recommendation reflects widespread cropland applications of fenamiphos. Use rates were calculated by dividing the total pounds of fenamiphos used (where fenamiphos was applied to acreage) by the total number of acres treated.

Table 1. Annual Agricultural Use of Fenamiphos (Pounds of Active Ingredient)

County	**1995**	**1994**	**1993**
Fresno	42,580.0	35,547.6	50,300.6
Santa Barbara	17,599.1	27,670.9	49,440.0
Kern	35,103.0	25,080.3	31,226.7
Monterey	28,547.3	26,788.7	28,143.9
Tulare	12,413.9	11,565.6	19,018.0
Madera	10,091.7	10,572.0	11,083.7
San Luis Obispo	10,900.9	14,075.0	10,600.3
San Joaqin	7,541.7	4,471.2	8,783.0
Riverside	5,416.2	5,782.2	8,241.2
Ventura	6,587.1	7,021.3	7,532.4
Merced	3,773.0	2,409.5	2,557.4
Stanislaus	913.9	1,301.1	1,957.4
County Totals	181,468.5	172,280.7	228,887.5
Percent of Total	***95.6***	***94.8***	***98.3***
CALIFORNIA TOTAL	**189,815.3**	**181,656.9**	**232,932.7**

According to the PUR, Fresno County routinely receives the greatest applications of fenamiphos; Fresno County growers use nearly one-quarter of all the fenamiphos reported used in California. Table 2 summarizes the total amounts and average daily rates of fenamiphos applied in Fresno County—the

county of highest use—during the months of greatest use. Applications are highest in April and early May.

Table 2. Applications of Fenamiphos in Fresno County

	1995		1994		1993	
County - Month	*Lbs Used*[1]	*Rate*[2]	*Lbs Used*[1]	*Rate*[2]	*Lbs Used*[1]	*Rate*[2]
Fresno - April	17,434.9	1.5	16,314.9	1.3	19,044.9	1.5
Fresno - May	12,454.2	1.2	4,354.1	1.3	11,762.7	1.3

[1] In pounds of active ingredient.

[2] Average rate (in pounds of active ingredient per acre).

For fenamiphos, no consistent use patterns exist where this pesticide is applied at or near the maximum label rates. Furthermore, from 1992 through 1995, fenamiphos was not predictably applied at rates greater than 2.5 lbs AI/acre. However, the greatest average rates of fenamiphos applications occur to stone fruit (cherry, nectarine, peach) crops (Table 3). For these crops, average application rates range from 0.5 to 8.7 lbs AI/acre.

Table 3. Averaged Monthly Rate of Fenamiphos Use for 1993 through 1995.

County-Month	Commodity	lbs Used	Acres	Rate
Fresno - September	Nectarine/Peach	335.0	112.0	2.5 - 3.5
Fresno - October	Nectarine/Peach	900.0	300.1	2.0 - 3.4
San Joaquin - April	Nectarine/Peach	81.0	17.0	4.4
San Joaquin - June	Cherry	425.0	92.0	4.4 - 4.6
San Joaquin - July	Cherry	282.0	42.0	4.4 - 8.7
San Joaquin - September	Cherry/Nectarine/Peach	144.4	41.5	2.9 - 8.7
San Joaquin - October	Cherry/Nectarine/Peach	388.7	85.0	2.0 - 8.4
Stanislaus - October	Nectarine	78.1	29.0	2.9 - 4.4

[1] In pounds active ingredient per acre.

C. RECOMMENDATIONS

1. Ambient Air Monitoring

The historical trends in fenamiphos use suggest that monitoring should occur over a 30- to 45-day sampling period in Fresno County during the month of April. Three to five sampling sites should be selected in relatively high-population areas or in areas frequented by people. Sampling sites should be located near grape growing areas. Ambient samples should not be collected from samplers immediately adjacent to fields or orchards where fenamiphos is being applied. At each site, twenty to thirty discrete 24-hour samples should be taken during the sampling period. Background samples should be collected in an area distant to fenamiphos applications.

Replicate (collocated) samples are needed for five dates at each sampling location. Two collocated samplers (in addition to the primary sampler) should be run on those days. The date chosen for replicate samples should be distributed over the entire sampling period. They may, but need not be, the same dates at every site. Field blank and spike samples should be collected at the same environmental conditions (e.g., temperature, humidity, exposure to sunlight) and experimental conditions (e.g., air flow rates) as those occurring at the time of ambient sampling.

2. Application-Site Air Monitoring

Generally, the purpose of the application-site monitoring is to document the potential of a pesticide to be found in air when it is being applied at rates close to the maximum label rate. For fenamiphos, no consistent use patterns exist where this pesticide is applied at or near the maximum label rates. However, applications to several tree fruit crops regularly occur at rates greater than 2.5 lbs/acre. These applications occur to citrus (orange/lemon) and stone fruit (cherry, nectarine, peach) crops. For these crops, average application rates range from 0.5 to 8.7 lbs AI/acre. These application rates are routinely found in the summer and early fall in Fresno, San Joaquin, and Stanislaus Counties.

Therefore, the historical trends in use suggest that application-site air monitoring should be conducted in the counties and months listed in Table 3. Selecting a location appropriate for application site monitoring for fenamiphos will require a more extensive coordination with the growers and the agricultural commissioners in these counties. We recommend that monitoring be conducted in association with the highest possible use rate.

When establishing monitoring stations, care should be taken to prevent nearby applications from contaminating collected samples. A three day monitoring period should be established with sampling times as follows: application + 1 hour, followed by one 2-hour sample, one 4-hour sample, two 8-hour samples and two 24-hour samples. A minimum of four samplers should be positioned, one on each side of the field. A fifth sampler should be collocated at one position. Background samples should collect enough volume (either 12 hours at 15 liters/min, or a shorter period with a higher volume pump) to permit a reasonable minimum detection level. Ideally, samplers should be placed a minimum of 20 meters from the field. Field blank and field spike samples should be collected at the same

environmental conditions (temperature humidity, exposure to sunlight) and experimental conditions (similar air flow rates) as those occurring at the time of sampling.

Additionally, we request that you provide in the monitoring report: 1) an accurate record of the positions of the monitoring equipment with respect to the field, including the exact distance that the sampler is positioned from the field; 2) an accurate drawing of the monitoring site showing the precise location of the meteorological equipment, trees, buildings, and other obstacles; 3) meteorological data collected at a minimum of 15-minute intervals including wind speed and direction, humidity, and air temperature, and comments regarding degree of cloud cover; and 4) the elevation of each sampling station with respect to the field, and the orientation of the field with respect to North (identified as either true or magnetic North).

D. REFERENCES

DPR. 1993-1995. Annual Pesticide Use Reports. Department of Pesticide Regulation, Sacramento, California.

Montgomery, J.H. 1993. Agrochemicals Desk Reference: Environmental Data. Lewis Publishers, Ann Arbor, Michigan.